LARGE STONE BINDER MSP-92-02D

1.0 Description. This specification covers material, equipment, and construction requirements for production and placement of a large stone binder (LB) asphaltic concrete, consisting of an asphalt binder combined with a graded aggregate to form a dense mixture containing 1 1/2 inch (38 mm) nominal maximum size aggregate.

1.1 Unless otherwise stated, specification section references are from the version, in effect at the time of this contract, of the Missouri Standard Specifications for Highway Construction, and its supplements.

1.2 LB shall meet all requirements of Secs 403 and 404 for a Type I-B asphaltic concrete mixture, except as herein modified.

1.3 Bituminous test strips are required to determine the rolling pattern and compactive effort necessary to provide the specified density.

2.0 Materials. All materials shall conform to Division 1000, Materials Details, except as herein modified.

2.1 Asphalt Binder. The asphalt binder shall be Performance Graded (PG) as specified elsewhere in the plans.

2.2 Coarse Aggregate.

2.2.1 Gravel aggregate will not be permitted.

2.2.2 Coarse aggregate shall be furnished and stockpiled in three or more separate sizes or fractions. One fraction shall consist of material with at least 75 percent retained on the 3/4 inch (19.0 mm) sieve. A second fraction shall consist of material retained on the 1/2 inch (12.5 mm) sieve. Other fractions shall consist of material passing the 1/2 inch (12.5 mm) sieve. A tolerance not to exceed 25 percent may be permitted on the 1/2 inch (12.5 mm) sieve for each fraction.

2.2.3 Add the following sieve to the table in Sec 1002.1.8:

Maximum Size of Fraction	Maximum Percent Passing No. 200 (75 mm) Sieve
1 1/2 inch (37.5 mm)	2.0

2.3 Bituminous Mixture.

2.3.1 Composition. Prior to mixing with the asphalt binder the total aggregate, including filler if needed, shall meet the following gradation:

Sieve Size	Percent Passing by Weight
1 1/2 inch (37.5 mm)	100
1 inch (25.0 mm)	70 - 90
3/4 inch (19.0 mm)	58 - 80
1/2 inch (12.5 mm)	44 - 70
3/8 inch (9.5 mm)	38 - 60
No. 4 (4.75 mm)	24 - 46
No. 8 (2.36 mm)	18 - 33
No. 16 (1.18 mm)	12 - 24
No. 30 (600 µm)	7 - 16
No. 50 (300 µm)	4 - 12
No. 100 (150 µm)	3 - 8
No. 200 (75 µm)	2 - 7

2.3.2 Job Mix Formula.

2.3.2.1 Test Method. Mixtures shall be compacted and tested in accordance with the modified AASHTO T 245 test method, altered to make and test 3 3/4 inch by 6 inch (95.3 mm by 152.4 mm) diameter specimens, listed in Appendix A of Federal Highway Administration publication FHWA-EP-90-509-007 and described as the "National Center for Asphalt Technology Procedure for Design of Large Stone Mixes". The 112 compaction blow method shall be used, which is described in the method as resulting in densities equivalent to the 75 blow method for AASHTO T 245.

2.3.2.2 Mixtures shall have minimum stability and voids in the mineral aggregate (VMA) as listed below, and shall have an air void content within the range listed below, when calculated from a voidless mixture composed of the same materials in like proportions.

Modified AASHTO T 245:

Percent Air Voids	Stability, Pounds (Kilograms) (min.)	Voids in Mineral Aggregate (min.)
3.5 - 5.5	3000 (1360)	11

3.0 Equipment.

3.1 Heating and Mixing. The contractor is advised that the larger aggregates may require longer heating and/or retention times in the bituminous mixing plant. Equipment and procedure modifications shall be made as necessary to insure that all particles are thoroughly coated and the proper temperatures are attained.

3.1.1 Any load of mixture showing signs of uncoated aggregate particles shall be cause for rejection.

3.2 Material Transfer Vehicle. A Material Transfer Vehicle (MTV), operating as an independent unit not attached to the paver, shall be used to deliver the bituminous mixture to the paver.

3.2.1 The MTV shall be a commercially manufactured unit specifically designed to transfer mixture from haul units to the paver without depositing the mixture on the roadway. It or the paver hopper shall be designed so that the bituminous mixture receives additional mixing action, either in the MTV unit or the paver hopper.

3.2.2 The MTV shall not be used as a haul unit between the plant and paver.

3.2.3 Use of the MTV will not be considered cause to violate load limits on structures or the roadway. Appropriate permits shall be obtained for any equipment exceeding the legal limits.

3.3 Rollers. The number of rollers furnished shall be sufficient to obtain the required compaction while the mixture is in a workable condition. The contractor is advised that, to achieve the required density, it may be necessary to employ heavy, pneumatic rollers (possibly 30 - 35 tons (30 - 35 Mg)). However, use of a roller of this size will not constitute acceptance of the final product nor waive the density requirements.

4.0 Construction.

4.1 Gradation Control. Add the following sieve to Sec 403.5(b):

Sieve Size	Percentage Points
1 inch (25.0 mm)	± 5.0

4.2 Segregation Control. The contractor shall take all means necessary to avoid segregation. In addition:

4.2.1 Segregated material accumulating at the outside of paver wings shall not be incorporated into the mat and shall be discarded at the end of each day's production.

4.2.2 Segregated areas identified by the engineer shall be removed and replaced by the contractor at no cost, for the depth of the affected lift and for an area suitable to allow for satisfactory replacement. No other forms of remedial treatment will be considered acceptable.

4.3 Mix Temperature. The temperature of the mixture at the time of delivery to the paver shall be maintained at a minimum of 300 F (150 C), unless otherwise directed by the engineer.

4.4 Lift Thickness. No individual layer of LB shall have a compacted thickness greater than 5 inches (125 mm) nor less than 3 inches (75 mm), with the exception of taper sections. No taper section shall be less than 2 inches (50 mm) in thickness, which will require coldmilling or other means satisfactory to the engineer to form a suitable butt joint in the underlying material without material segregation.

4.5 Compaction. Rolling shall follow the pattern established in the bituminous test strips.

4.5.1 All rolling, including final rolling, should be completed prior to the surface temperature of the mixture decreasing to 200 F (95 C).

4.5.2 Unless otherwise specified, rolling shall continue until all roller marks are eliminated and a minimum density of 96 percent of a laboratory specimen made in the proportions of the job-mix formula in accordance with the mix design procedure, herein described, is attained. Density will be determined in accordance with section 403.18.5 of the Standard Specifications.

4.5.3 Crushing of aggregates will not be allowed.

5.0 Basis of Payment. Measurement and payment will be in accordance with Sec 403 except pay items for the mineral aggregate and asphalt binder will be included in the contract for Large Stone Binder (LB) Asphaltic Concrete.